

Serial No. 10/014,363
Filed: December 11, 2001

Amendment to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A conjugate comprising an erythropoietin glycoprotein having an N-terminal α -amino group and one poly(ethyleneglycol), said erythropoietin glycoprotein being selected from the group consisting of human erythropoietin, analogs thereof that have from 1 to 6 additional sites for glycosylation, and human erythropoietin having at least one glycosylation site that is rearranged, and being covalently linked to one poly(ethylene glycol) group of the formula



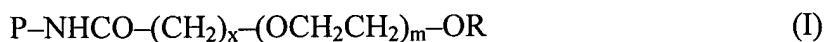
wherein the -CO of the poly(ethylene glycol) group forms an amide bond with the N-terminal α -amino group of the erythropoietin glycoprotein;

R is lower alkyl;

x is 2 or 3; and

m is from about 450 to about 1350.

2. (Original) The conjugate of claim 1, having the formula



wherein P is the residue of the erythropoietin glycoprotein without the N-terminal α -amino group which forms an amide linkage with the poly(ethylene glycol) group.

3. (Original) The conjugate of claim 1, wherein R is methyl.
4. (Original) The conjugate of claim 1, wherein m is from about 550 to about 1000.
5. (Original) The conjugate of claim 4, wherein m is from about 650 to about 750.
6. (Original) The conjugate of claim 4, wherein R is methyl.
7. (Original) The conjugate of claim 2 having the formula



wherein m is from about 650 to about 750.

8. (Original) The conjugate of claim 1, wherein the glycoprotein is a human erythropoietin.
9. (Original) The conjugate of claim 8, wherein the human erythropoietin glycoprotein is expressed by endogenous gene activation.

10. (Currently amended) The conjugate according to claim 8, wherein the glycoprotein has the sequence shown in Fig. 1 or Fig. 2 selected from SEQ ID NO:1 or SEQ ID NO: 2.

11. (Original) The conjugate according to claim 8, wherein the glycoprotein has the sequence of human erythropoietin modified by the addition of from 1 to 6 glycosylation sites.

12. (Original) The conjugate according to claim 11, wherein the glycoprotein has the sequence of human erythropoietin which is modified by a modification selected from the group consisting of:

Asn³⁰Thr³²;
Asn⁵¹Thr⁵³,
Asn⁵⁷Thr⁵⁹;
Asn⁶⁹;
Asn⁶⁹Thr⁷¹;
Ser⁶⁸Asn⁶⁹Thr⁷¹;
Val⁸⁷Asn⁸⁸Thr⁹⁰;
Ser⁸⁷Asn⁸⁸Thr⁹⁰;
Ser⁸⁷Asn⁸⁸Gly⁸⁹Thr⁹⁰;
Ser⁸⁷Asn⁸⁸Thr⁹⁰Thr⁹²;
Ser⁸⁷Asn⁸⁸Thr⁹⁰Ala¹⁶²;
Asn⁶⁹Thr⁷¹Ser⁸⁷Asn⁸⁸Thr⁹⁰;
Asn³⁰Thr³²Val⁸⁷Asn⁸⁸Thr⁹⁰;
Asn⁸⁹Ile⁹⁰Thr⁹¹;
Ser⁸⁷Asn⁸⁹Ile⁹⁰Thr⁹¹;
Asn¹³⁶Thr¹³⁸;

Asn¹³⁸Thr¹⁴⁰;

Thr¹²⁵; and

Pro¹²⁴Thr¹²⁵.

13. (Original) The conjugate according to claim 1, wherein the glycoprotein has the sequence of human erythropoietin modified by a rearrangement of at least one glycosylation site.

14. (Original) The conjugate of claim 13, wherein the rearrangement comprises deletion of any of the N-linked glycosylation sites in human erythropoietin and addition of an N-linked glycosylation site at position 88 of the sequence of human erythropoietin.

15. (Original) The conjugate of claim 14, wherein the glycoprotein has the sequence of human erythropoietin modified by a modification selected from the group consisting of:

Gln²⁴ Ser⁸⁷ Asn⁸⁸ Thr⁹⁰;

Gln³⁸ Ser⁸⁷ Asn⁸⁸ Thr⁹⁰; and

Gln⁸³ Ser⁸⁷ Asn⁸⁸ Thr⁹⁰.

16. (Original) A pharmaceutical composition comprising the conjugate of claim 1 and a pharmaceutically acceptable excipient.

17. (Original) A method of treating anemia in a patient afflicted with chronic renal failure (CRF) or AIDS or resulting from chemotherapy, comprising administering to said patient an effective amount of a conjugate of claim 1.

18. (Original) A process of making a conjugate of claim 1, comprising

- a) expressing and fermenting a recombinant EPO protein that has an N-terminal peptidic extension that includes a proteolytic cleavage sequence,
- b) protecting the ϵ -amino groups,
- c) proteolytically cleaving the N-terminal peptidic extension,
- d) pegylating the N-terminal α -amino group, and
- e) deprotecting the ϵ -amino groups of the EPO glycoprotein.

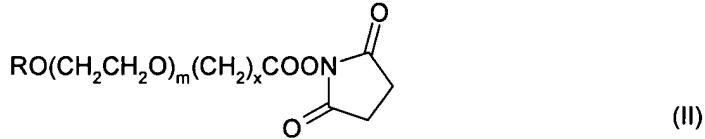
19. (Original) The process of claim 18 wherein the fermentation in step a) is serum free.

20. (Original) The process of claim 18 wherein any one of steps a)-e) is followed by a purification step.

21. (Currently amended) The process of claim 18 wherein the recombinant EPO comprises a sequence selected from the group consisting of the amino acid sequences shown in any one of Figures 1, 2, 3, 4 and 5 SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO 4: and SEQ ID NO: 5.

22. (Original) The process according to claim 18 wherein in step b) the ϵ -amino groups are protected by citraconylation.

23. (Original) The process of claim 18 wherein the N-terminal α -amino group in step d) is pegylated with a group



wherein

R is lower alkyl;

x is 2 or 3; and

m is from about 450 to about 1350.

24. (Currently amended) An erythropoietin glycoprotein comprising the an amino acid sequence of Fig. 1 or Fig. 2 selected from SEQ ID NO:1 and SEQ ID NO:2 and having an N-terminal peptidic extension that is a proteolytic cleavage site.

25. (Original) The erythropoietin glycoprotein of claim 24 which also comprises an N-terminal purification tag.

26. (New) The process of claim 23 wherein in the compound of formula II R is methyl, x is 3, m is from about 650 to about 750, and the pegylation reaction in step d) is performed at a molar ratio of 1:5 (protected EPO of step b to reagent of formula II).

27. (New) The process of claim 26 wherein in step b) the ϵ -amino groups are protected by citraconylation.

28. (New) The process of claim 27, wherein in step e) deprotection of the ϵ -amino groups is achieved by stirring the product of step d) at a pH of 2.5 for 5 h at ambient temperature.

29. (New) The process of claim 28 wherein step e) is followed by purification step using chromatography.

30. (New) The process of claim 29 wherein the chromatography is carried out on an SP-Sepharose column.

31. (New) The conjugate of claim 1, wherein m is from 550 to 1000.

32. (New) The conjugate of claim 4, wherein m is from 650 to 750.

33. (New) The conjugate of claim 2 having the formula



wherein m is from 650 to 750.